B737NG Alerting Issues – Uncommanded yaw or roll

1. Initiating Condition: Wake encounter

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/ suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	PFD bank pointer turns amber	Bank angle > 35 degrees	Alert not definitive as to cause			Reduction of bank angle
Aural Alerts	GPWS "Bank Angle"	35, 40, and 45-degree bank angle	Alert not definitive as to cause			
Tactile Alerts	None					
Visual Cues	Roll rate on PFD/EADI		Underlying cause of the yaw/roll may not be cued, or the cues may be ambiguous/require effortful interpretation			
Aural Cues	None					
Tactile/ Somatic Cues	Wheel may move opposite the roll if autopilot is engaged.		Underlying cause of the wheel deflection may not be cued, or the cues may be ambiguous/require effortful interpretation			

Expected Pilot Response(s)

- Disconnect autopilot/autothrottle.
- Verify symmetrical thrust.
- Confirm spoilers are retracted
- Apply opposing roll and/or yaw inputs to control aircraft attitude.
- Recover from nose-down upset if necessary.

Possible sources of confusion with regard to pilot response(s)

- Pilots may have to react to an uncommanded roll with different controls (wheel vs. rudder pedals) depending on the cause, which will probably be unclear based on the lack of definitive cues and the extreme time pressure. (Note: The procedure instructs pilots to use "all available controls" which is an attempt to reduce the diagnostic workload.)

How does pilot know condition is resolved/recovered?

- Condition is resolved when aircraft control is regained.

Issues with regard to multiple concurrent non-normal conditions

- Pilots may be confronted with unusual flight control difficulties and/or alerts/cues as they cope with a roll or yaw/roll upset.

B737NG Alerting Issues – Uncommanded yaw or roll

2. Initiating Condition: Uncommanded rudder deflection or rudder pedal kicks

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	PFD bank pointer turns amber	Bank angle > 35 degrees	Alert not definitive as to cause			Reduction of bank angle
Aural Alerts	GPWS "Bank Angle"	35, 40, and 45-degree bank angle	Alert not definitive as to cause			
Tactile Alerts	None					
Visual Cues	Roll rate on PFD/EADI					
	Yaw rate on ND/EHSI					
Aural Cues	None					
Tactile/ Somatic Cues	Lateral-g					
	Rudder pedals may deflect in rudder hardover (but not in yaw damper malfunction)		Underlying cause of the rudder and/or wheel deflections may not be cued, or the cues may be ambiguous/require effortful interpretation. It may not be clear to the pilots whether the control inputs are causing the upset or responding to it.	Interpretation of rudder and wheel deflections can be difficult because the direction of deflection (into or opposite the yaw) depends on the underlying cause		

B737NG Alerting Issues – Uncommanded yaw or roll

2. Initiating Condition: Uncommanded rudder deflection or rudder pedal kicks – Cont.

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/suppressed or when cue is masked	How alert or cue is terminated
Tactile/ Somatic Cues	Wheel may move opposite the roll if autopilot is engaged		Underlying cause of the rudder and/or wheel deflections may not be cued, or the cues may be ambiguous/require effortful interpretation. It may not be clear to the pilots whether the control inputs are causing the upset or responding to it.	Interpretation of rudder and wheel deflections can be difficult because the direction of deflection (into or opposite the yaw) depends on the underlying cause		

Expected Pilot Response(s)

- Disconnect autopilot/autothrottle.
- Verify symmetrical thrust.
- Confirm spoilers are retracted
- Apply opposing roll and/or yaw inputs to control aircraft attitude, using significant force if necessary.
- Reduce AOA/pitch/altitude as required to regain roll authority.
- Disconnect yaw damper.
- Recover from nose-down upset if necessary.
- Perform "Jammed or Restricted Flight Controls" procedure, selecting the rudder branch of the checklist.

Possible sources of confusion with regard to pilot response(s)

- Pilots may have to react to an uncommanded roll with different controls (wheel vs. rudder pedals) depending on the cause, which will probably be unclear based on the lack of definitive cues and the extreme time pressure. (Note: The procedure instructs pilots to use "all available controls" which is an attempt to reduce the diagnostic workload.)

How does pilot know condition is resolved/recovered?

- Condition is resolved when aircraft control is regained and uncommanded control deflections have been either neutralized or compensated for in all anticipated circumstances for the remainder of the flight.
- If there are residual uncommanded control deflections or pressures, there may be operational implications through to landing (e.g., crosswind limitations).

Issues with regard to multiple concurrent non-normal conditions

- Pilots may be confronted with unusual flight control difficulties and/or alerts/cues as they cope with a roll or yaw/roll upset.

B737NG Alerting Issues – Uncommanded yaw or roll

3. Initiating Condition: Uncommanded aileron/spoiler/flap/slat

Type	Alert or cue	Threshold for alert or cue to be presented	Confusion regarding alert or cue	Other issues with regard to alert or cue	When alert is inhibited/ suppressed or when cue is masked	How alert or cue is terminated
Visual Alerts	Amber "LE Flaps Transit" light on forward panel, under some conditions	If condition is a LE slat/flap out of the commanded position, this light illuminates when the LE flap/slat position is inconsistent with the TE flap position				
	PFD bank pointer turns amber	Bank angle > 35 degrees	Alert not definitive as to cause			Reduction of bank angle
Aural Alerts	GPWS "Bank Angle"	35, 40, and 45- degree bank angle	Alert not definitive as to cause			
Tactile Alerts	None					
Visual Cues	Roll rate on PFD/EADI, flap/slat gauge indications if involved					
Aural Cues	None					
Tactile/ Somatic Cues	Wheel may move opposite the roll if uncommanded flap/slat/aileron/spoiler deflection and autopilot is engaged; however, wheel may move in same direction as roll if landing gear mechanism interferes with aileron/spoiler controls or other malfunction occurs.		Underlying cause of the wheel deflection may not be cued, or the cues may be ambiguous/require effortful interpretation	Interpretation of wheel deflection is difficult because the direction of deflection (into or opposite the roll) depends on the underlying cause		

B737NG Alerting Issues – Uncommanded yaw or roll

3. Initiating Condition: Uncommanded aileron/spoiler/flap/slat – Cont.

Expected Pilot Response(s)

- Disconnect autopilot/autothrottle.
- Verify symmetrical thrust.
- Confirm spoilers are retracted
- Apply opposing roll and/or yaw inputs to control aircraft attitude, using significant force if necessary to activate breakout features in the event of control jam.
- Recover from nose-down upset if necessary

Possible sources of confusion with regard to pilot response(s)

- Pilots may have to react to an uncommanded roll with different controls (wheel vs. rudder pedals) depending on the cause, which will probably be unclear based on the lack of definitive cues and the extreme time pressure. (Note: The proceduresinstructs pilots to use "all available controls" which is an attempt to reduce the diagnostic workload.)

How does pilot know condition is resolved/recovered?

- Condition is resolved when aircraft control is regained and uncommanded control deflections have been either neutralized or compensated for in all anticipated circumstances for the remainder of the flight.
- If there are residual uncommanded control deflections or pressures, there may be operational implications through to landing (e.g., crosswind limitations).

Issues with regard to multiple concurrent non-normal conditions

- Pilots may be confronted with unusual flight control difficulties and/or alerts/cues as they cope with a roll or yaw/roll upset.